

ET Adjustment Factors

ESHMC

August 2008

B. Contor

Review ESPAM1.1

- ET on irrigated lands: traditional calculation

$$ET = ETr \times Kc$$

Review ESPAM1.1

- ETr calculated from weather-station data
- Kc from published tables
 - crop specific
 - empirically derived
 - based on varieties & practices common at the time coefficients were developed
 - assumes "well-watered disease-free" condition

Review ESPAM1.1

- What if $Kc_{\text{true}} \neq Kc_{\text{table}}$?
- $Kc_{\text{true}} > Kc_{\text{table}}$
 - improved crop varieties
 - more intense management
 - more frequent irrigation (evap. component of ET increases)
 - better irrigation uniformity

Review ESPAM1.1

- $Kc_{\text{true}} < Kc_{\text{table}}$
 - "relaxed" management regime
 - economically rational w/ low-value crops (pasture)
 - disease, insects, low fertility
 - chronic or acute water stress
 - whole farm: quantity or timing of supply
 - parts of field: uniformity of application

Review ESPAM1.1

- What is to be done?



**ET Adjustment Factors
to the RESCUE!**

Review ESPAM1.1

- What is to be done?

$$ET = ET_r \times K_c \times \text{Adj. Factor}$$

ET Adjustment Factor

YES

- Variety differences
- Management differences
- Irrigation technology
- Water-supply issues
- System capacity issues
- Error in RED factor

No

- Year-to-year or systematic climate differences
 - we use actual weather-station data
- Changes in mix of crops grown
 - we use actual reported crop mix

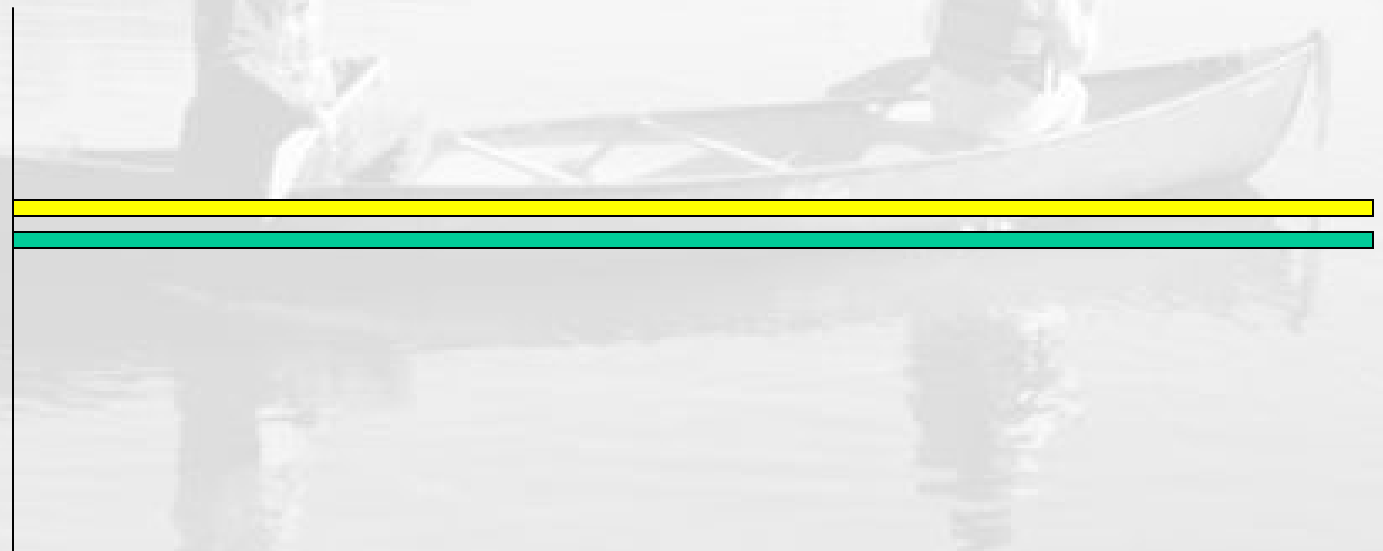
Current Capability of Recharge Tool



Current Capability of Recharge Tool

* *DO NOT* vary over time

Adj. Factor



Time

ITEMS FOR DISCUSSION

ISSUES

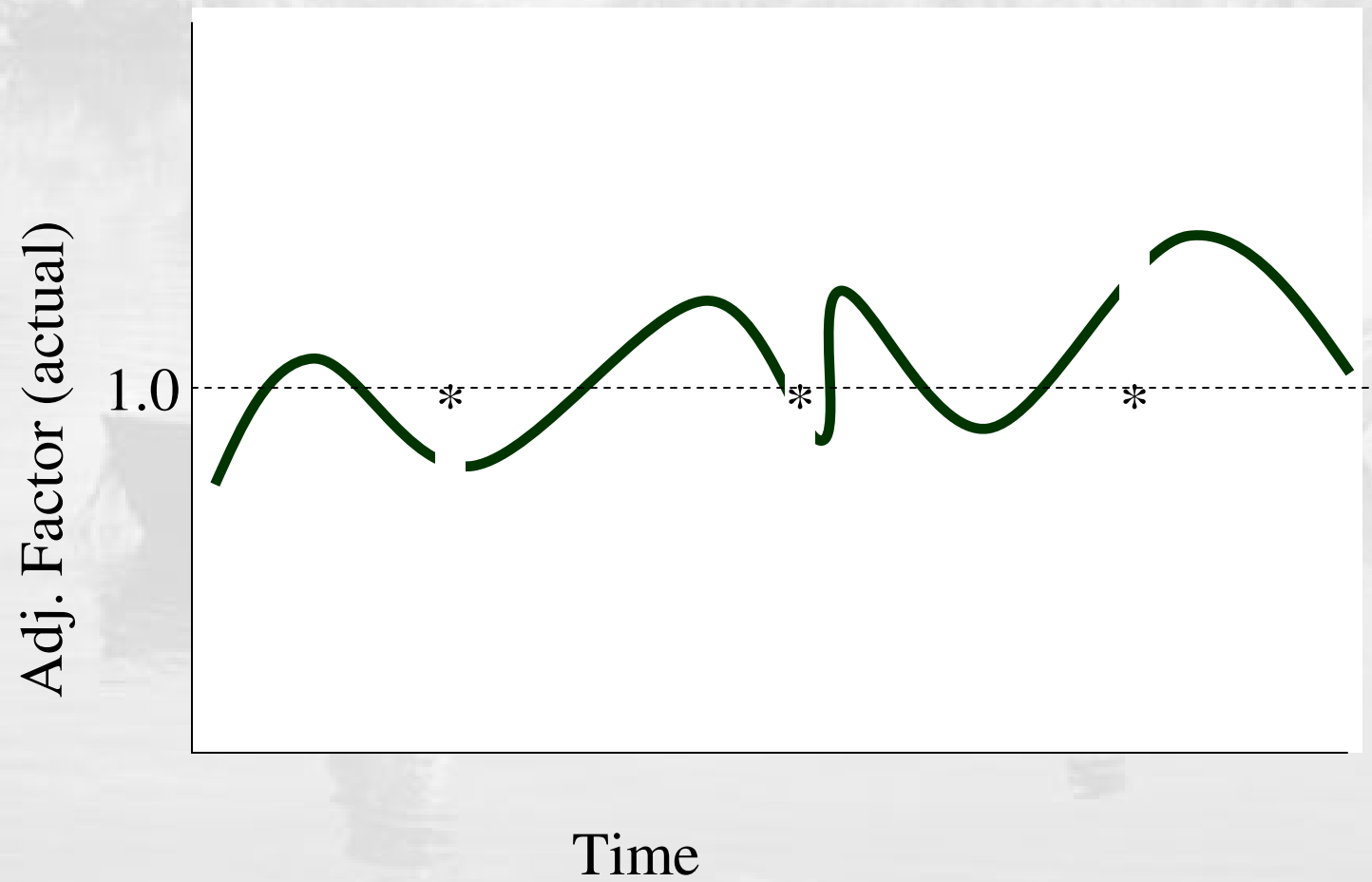
QUESTIONS

1. Metric/Traditional methods
2. Systematic Trend
3. Cyclical Behavior
4. Different Land-use Data
5. Sprinkler vs. Gravity
6. Entity-to-Entity Differences

- Review Proposed Decision
1. Use METRIC for Trend?
 2. Land-use Differences?
 3. METRIC define sprinkler vs. gravity?
 4. Theoretical/Professional Judgment sprinkler vs. gravity?
 5. Vary adjustment factor by entity?

ISSUES for ESPAM2: #1

- **METRIC ET** for some years
 - Data set = our best estimate of actual ET
- **Traditional ET** for some years
 - Data set includes all the concerns for which we use adjustment factors



Proposed Decision for ESHMC Review

- For METRIC years
 - ET adjustment factor = 1.0
- For All other Years
 - Some adjustment factors \neq 1.0
- This will require minor adjustment to recharge tools

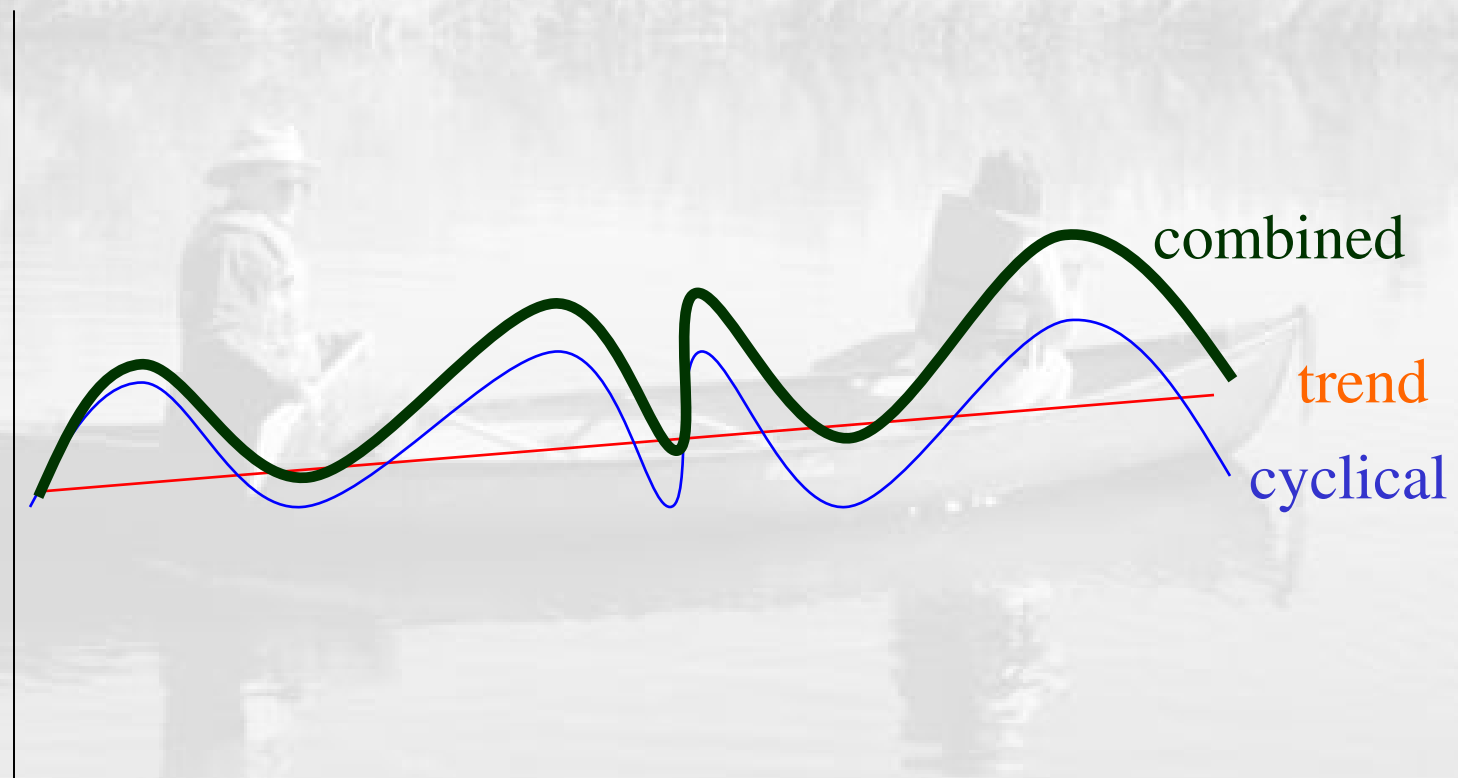
ISSUES for ESPAM2: #2

- **Systematic time trend in basic adjustment factor?**
 - improvement in varieties
 - increase in management intensity & use of other production inputs
 - increase in uniformity of irrigation systems

ISSUES for ESPAM2: #3

- **Cyclical behavior in basic adjustment factor?**
 - water supply issues
 - interaction between climate & system design
 - summer 2005

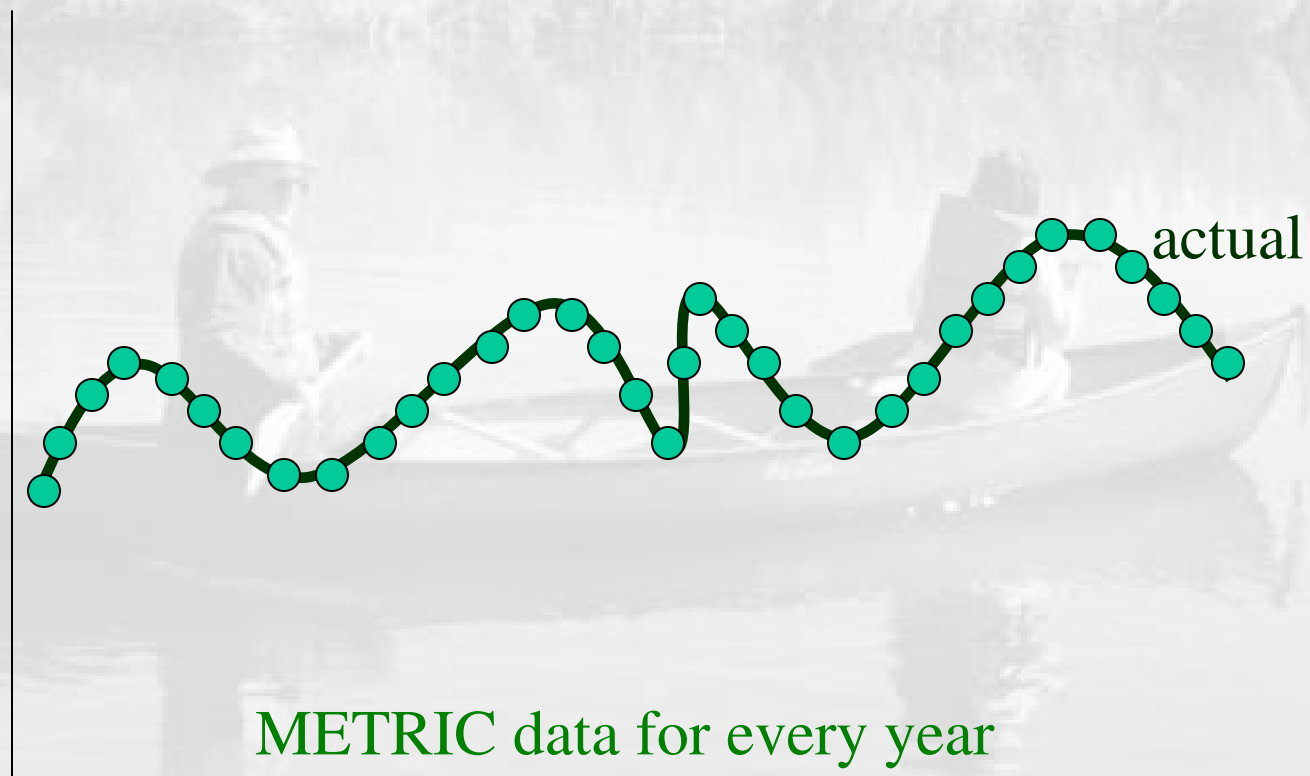
Hypothetical Actual Condition



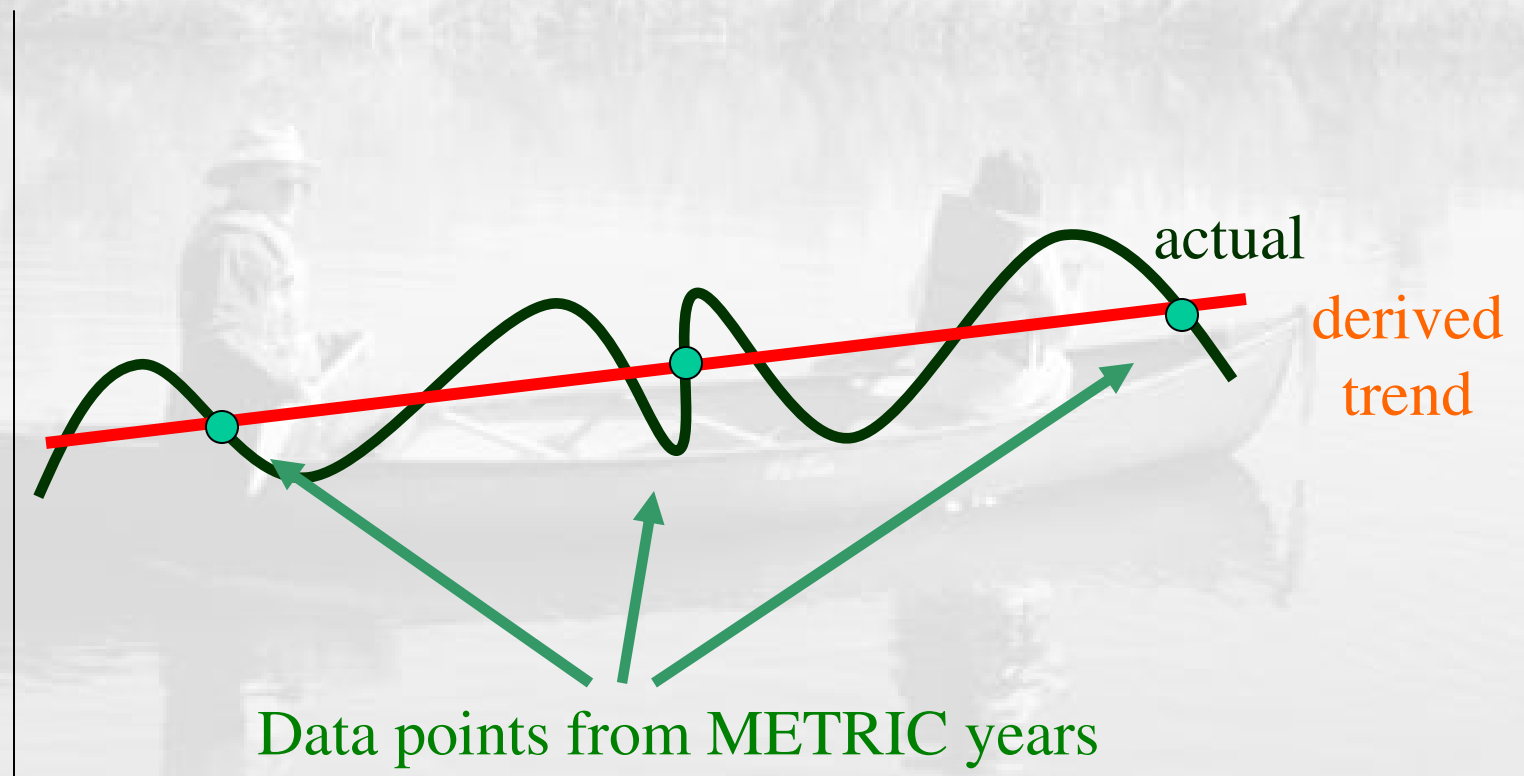
Question #1 for ESHMC Discussion

- Do we attempt to use individual METRIC years to define a long-term trend in basic adjustment factors?
 - will require additional mods to recharge tools

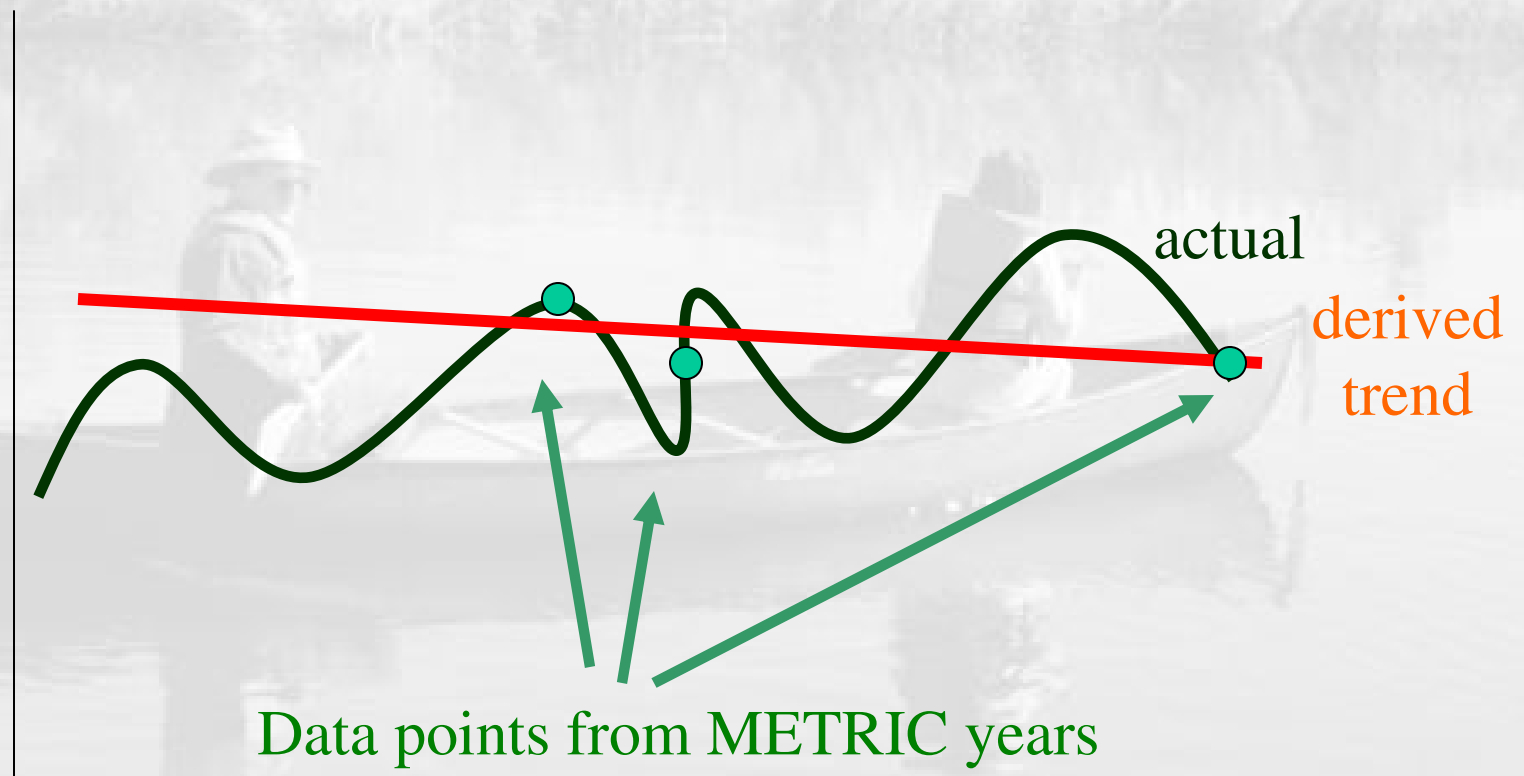
Ideal Model Representation



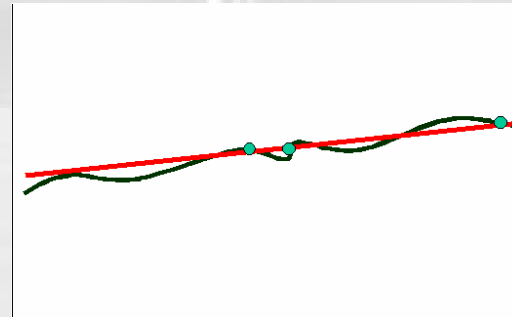
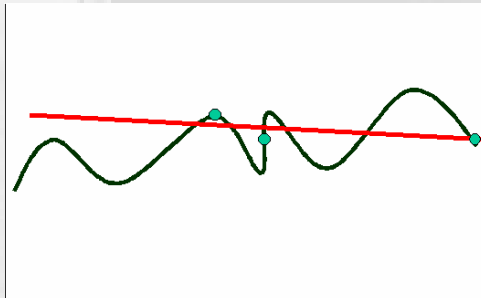
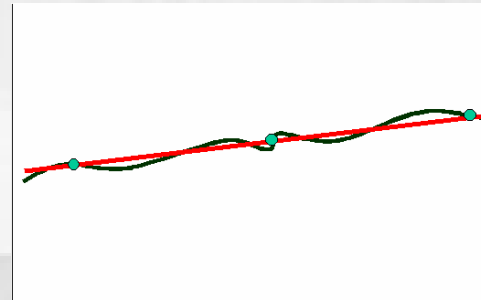
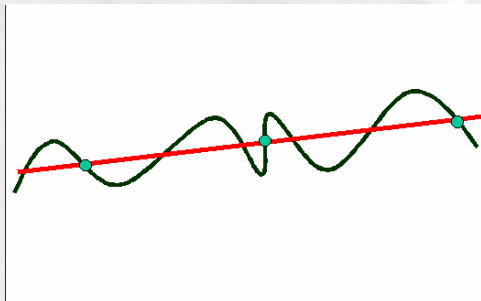
Best possible "real world"



Worst possible "real world"



What is the world really like?



Year**Images****Irrigated Lands Data**

1980

U2 - some

RASA (omits Big Lost, Oakely, RexBench)

1981

1982

1983

U2 - few

1984

1985



1986

NDVI (soon)

1987

AJ - all

1988

1989

1990

1991

1992

DOQQ - many

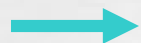
Aerial Photo-based

1993

DOQQ - few

1994

1995



1996

NDVI (eventually)

1997

1998

DOQQ - few

1999

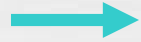


2000

LANDSAT

2001

SPOT - many



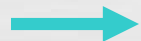
2002

2003

2004

NAIP - all

2005



2006

NAIP - all

IDWR (soon)

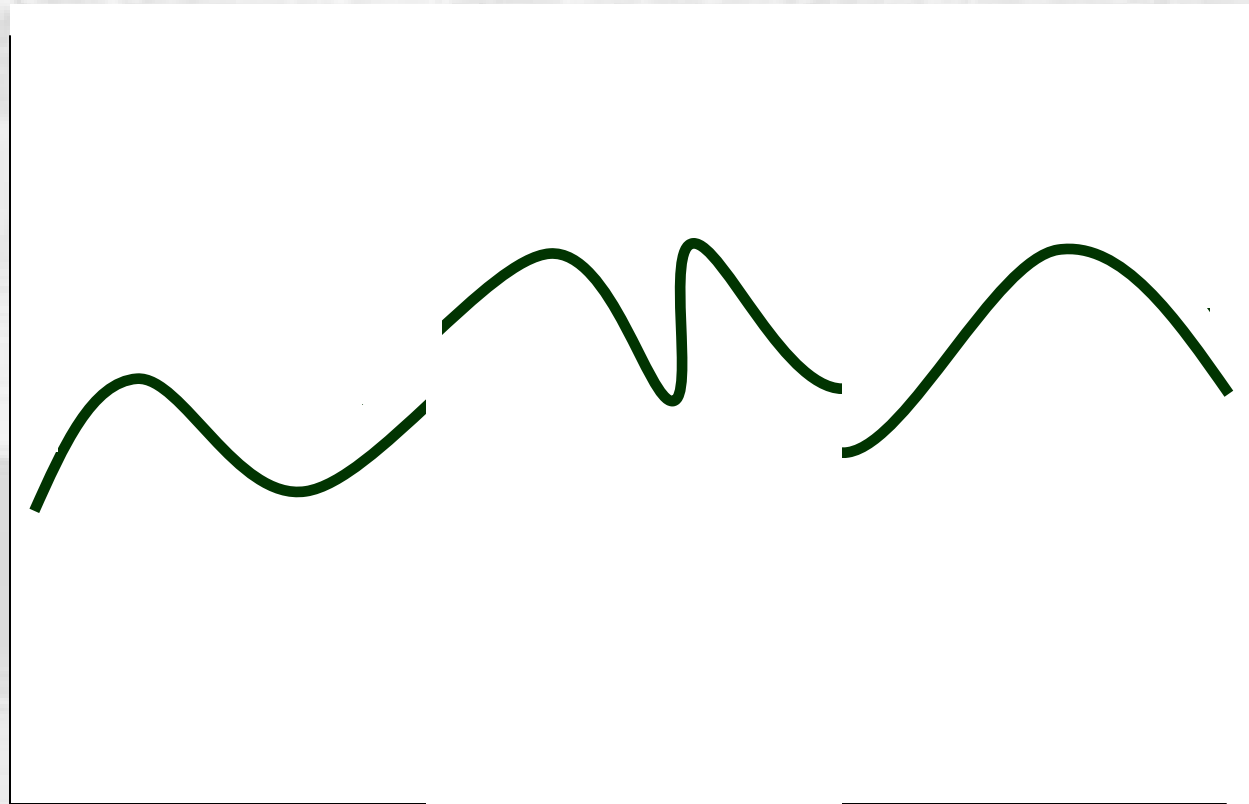
2007

2008

ISSUES for ESPAM2: #4

- **Different Land-cover Data** for different years
 - adjustment factors will implicitly compensate for errors in RED factor
 - do errors vary by land-cover or image data source?

Adj. Factor (actual)



Time



Question #2 for ESHMC Discussion

- Is there anything we could do about land-cover-data differences?
 - What data would we use?
 - Is there any guarantee we wouldn't make things worse?

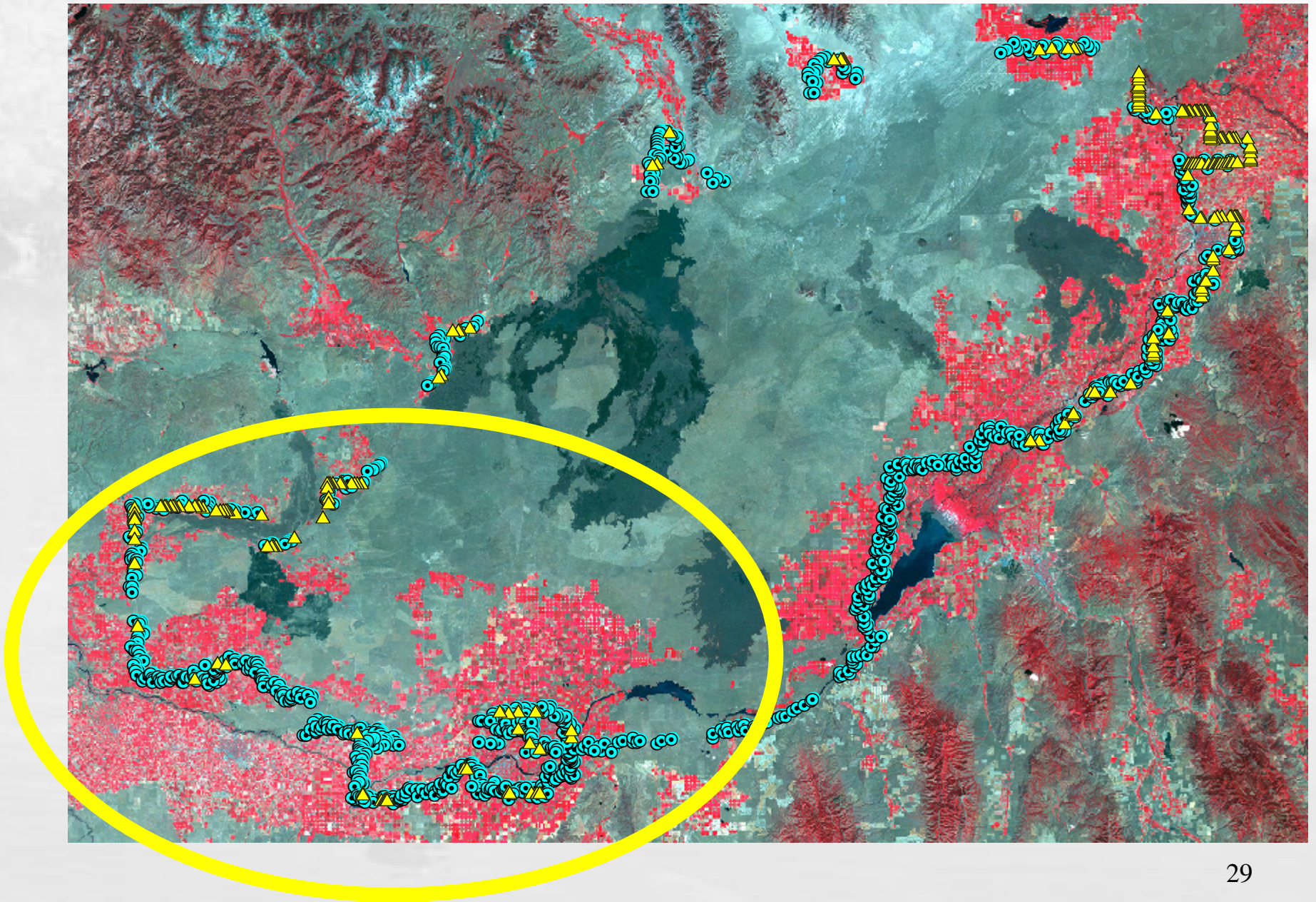
ISSUES for ESPAM2: #5

- **Theoretically we think sprinklers are different from gravity irrigation**
 - Wetting frequency
 - Uniformity of application
 - Management skill required
 - Delivery capacity in mid season



Question #3 for ESHMC Discussion

- Do we attempt to use METRIC data to differentiate between sprinkler & gravity ET adjustment factors?
 - recharge tool has this capability



Question #4

for ESHMC Discussion

- Do we use theoretical expectations and/or professional judgement to set sprinkler vs. gravity factors?
 - recharge tool has this capability
 - sprinkler = (base) + (differential/2)
 - gravity = (base) - (differential/2)

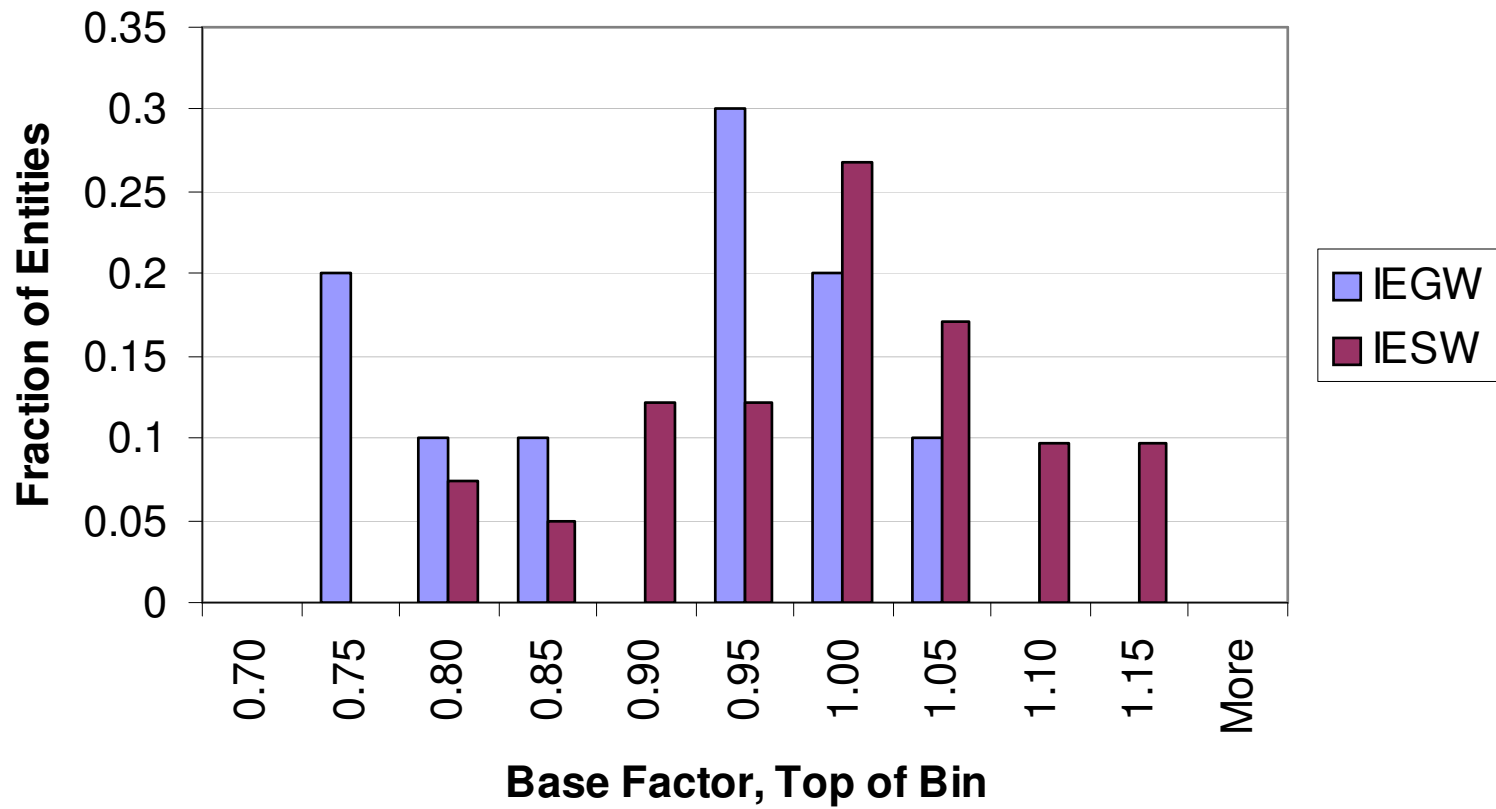
ISSUES for ESPAM2: #6

- **We might expect ET adjustment factor to vary by entity**
 - Cost of water influences management intensity & application methods
 - Crop mix varies by soil type, elevation, reliability of supply, local markets
 - Water stress varies by adequacy of supply

Question #5 for ESHMC Discussion

- Do we vary ET adjustment factor by Irrigation Entity?
 - recharge tool has this capability
 - capability was not used in ESPAM1.1
(all entities had the same factors)

Sample Base ET Adjustment Factor



REVIEW

ISSUES

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